two second cavities **50** in the housing member spaced from the acoustic back cavity; and an airflow spreader **38** connected to the housing member **36**, where the airflow spreader comprises a conduit system **44**, **46** connecting the acoustic back cavity **48** directly with each of the at least two second cavities **50** through the airflow spreader.

[0036] The "housing member" may comprise multiple members connected to one another. For example, there are speaker modules which comprise both a transducer and a back cavity. The speaker module may be merely located in a seat of another member, such as inside a cover of a mobile phone. The associated distributed cavities in the cover may be acoustically connected to the back cavity in the speaker module meaning. Thus, the acoustic back cavity is provided inside the speaker module rather than the cover. However, the cover and the module together form the "housing member". The housing member could also comprise a PWB, a chassis, a flat display module, a battery holder and/or a battery itself, etc.

[0037] The housing member may comprise a cover member for a hand-held portable electronic device. The apparatus may further comprise a speaker connected to the housing member adjacent the acoustic back cavity, where the speaker forms the sound transducer. The at least two second cavities **50** may comprise different electronic circuitry therein. The at least two second cavities **50** may each be substantially sealed except for an aperture **46** into the conduit system of the airflow spreader. The airflow spreader may comprise two panels **40**, **42** sealingly connected to each other with an air chamber **44** therebetween as part of the conduit system, and holes **46** though one of the panels into respective ones of the acoustic back cavity **48** and the at least two second cavities **50**. A first one of the panels may comprise a printed wiring board of the apparatus. A second one of the panels may comprise a user interface frame member, where the user interface frame member holds a user interface of the apparatus. The air chamber may connect multiple ones of the second cavities to the acoustic back cavity. The air chamber may comprise multiple conduits connecting the second cavities to the acoustic back cavity in parallel and/or series. The apparatus may further comprise means for effectively combining the acoustic back cavity **48** with the at least two second cavities **50** via the airflow spreader **38** to create an effectively greater acoustic back cavity enclosure for the sound transducer. The acoustic back cavity and the at least two second cavities may be coupled by the conduit system of the airflow spreader to achieve a desired fundamental low frequency extension for the sound transducer. The apparatus may further comprise dampening material at a hole from the acoustic back cavity to the conduit system of the airflow spreader. The airflow spreader may be connected to a first distributed cavity which is connected in series with at least one other distributed cavity such as by an internal connection which is not part of the spreader.

[0038] In accordance with another example, an apparatus may comprise a sound transducer **34**; a housing **36** having the sound transducer connected thereto; and an acoustic back cavity system comprising a main back cavity **48** in the housing adjacent the sound transducer and a plurality of spaced additional cavities **50** in the housing connected in parallel with the main back cavity by a substantially closed air conduit system **44**, **46**. The air conduit system may comprise two panels sealingly connected to each other with an air chamber therebetween as part of the air conduit system, and holes though one of the panels into respective ones of the main back cavity and the additional cavities. A first one of the panels may comprise a printed wiring board of the apparatus. A second one of the panels may comprise a user interface frame member, where the user interface frame member holds a user interface of the apparatus.

[0039] Referring also to FIG. **11**, an example method may comprise providing a housing member with an acoustic back cavity for a sound transducer and a plurality of spaced additional cavities as indicated by block **70**; and connecting an airflow spreader to the housing member to provide an air conduit system connecting the back cavity directly with each of the plurality of spaced additional cavities through the airflow spreader as indicated by block **72**. The airflow spreader may comprise two panels sealingly connected to each other with an air chamber therebetween as part of the air conduit system, and holes though one of the panels into respective ones of the main back cavity and the additional cavities. A first one of the panels may comprise a printed wiring board of the apparatus. A second one of the panels may comprise a user interface frame member, where the user interface frame member holds a user interface of the apparatus.

[0040] Concerning the volume of a loudspeaker rear cavity, which defines the sensitivity of the resulting speaker system and the low frequency limit which is especially vital for moving coil loudspeakers, it can be stated as the bigger the rear volume the lower the frequency or alternatively the bigger the rear volume the higher the sensitivity. The reason is that the rear cavity has a stiffness associated with it, which depends on the rear cavity volume and the area of the speaker cone that is compressing it. Therefore, the larger the cone area the stiffer the air appears to be and the smaller the rear volume the stiffer the air appears to be. In both cases more force is required to compress the air in the rear cavity. The fundamental resonance of a speaker system depends on the mass of the driver, the combined stiffness of the air in the rear cavity and the suspension of the cone. The combination is stiffer than either the speaker or the rear cavity on its own, and therefore the resonance frequency becomes higher. As a result, for the system needs bass response improving without changing electro-acoustic characteristics, there is need for a larger rear cavity which in turn exhibits a smaller stiffness and hence a lower system resonance. Similar principle also applies on piezo and electrostatic loudspeakers. Thus, the back cavity requirement is also relevant for other loudspeaker modules (i.e. piezo-electric, electrostatic, etc.). Any speaker system radiating sound waves front and back would benefit from a controlled back cavity design.

[0041] The need of a larger rear cavity becomes more problematic when smaller transducers are designed for portable devices, wherein the portable device sizes are also getting smaller and smaller which generates problems for transducer integrations. Currently, there is a drive towards thinner products and larger displays. Unfortunately, this puts design pressure on the loudspeaker to be reduced in size. It is a known problem that size reduction of electrodynamic transducers cause degration in performance. This issue causes conflict when considering the trend in mobile devices where hands-free playback for music, ringtones and even speech becomes more and more populer. As a result, there is a strong motivation to achieve a good sound quality in mobile devices.

[0042] Features as described herein are used in maximizing the potential air volume for a speaker design inside an apparatus by using the pre-determined air spaces without influencing the apparatus size. This provides a distributed back